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<b>Notice of Allowability</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/647,569	FAVRO ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	Faye Polyzos	2878	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--**

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 8 August 2005.
2. ☒ The allowed claim(s) is/are 1-14 and 35-54.
3. ☒ The drawings filed on 25 August 2003 are accepted by the Examiner.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) ☐ All    b) ☐ Some\*    c) ☐ None    of the:
    1. ☐ Certified copies of the priority documents have been received.
    2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
    3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
  6. ☐ CORRECTED DRAWINGS ( as "replacement sheets") must be submitted.
    - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review ( PTO-948) attached
      - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.
    - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

- |   |  |
|---|--|
| 1. <input type="checkbox"/> Notice of References Cited (PTO-892)  | 5. <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)            |
| 2. <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                | 6. <input type="checkbox"/> Interview Summary (PTO-413),<br>Paper No./Mail Date _____. |
| 3. <input type="checkbox"/> Information Disclosure Statements (PTO-1449 or PTO/SB/08),<br>Paper No./Mail Date _____ | 7. <input type="checkbox"/> Examiner's Amendment/Comment                               |
| 4. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit<br>of Biological Material          | 8. <input checked="" type="checkbox"/> Examiner's Statement of Reasons for Allowance   |
|   | 9. <input type="checkbox"/> Other _____.   |

## **EXAMINER'S STATEMENT OF REASONS FOR ALLOWANCE**

### ***Comment on Submissions***

1. This communication is responsive to submissions 8 August 2005.

### ***Allowable Subject Matter***

2. Claims 1-14 and 35-54 are allowed.
3. The following is an examiner's statement of reasons for allowance:

Regarding independent claim 1, the prior art does not disclose or fairly suggest a defect detection system to induce acoustic chaos in a structure, comprising: a sound source, coupled to the structure, for applying a sound input signal to the structure in a manner so that the sound signal induces acoustic chaos in the structure to cause the structure to vibrate in a chaotic manner and heat the defect in order to identify the heated defects with a thermal imaging camera.

The examiner notes that while it is known in the art of a vibrothermography system comprising an ultrasonic transducer to apply acoustic energy to a sample wherein the acoustic energy is absorbed by the sample which causes internal frictional heating between the faces of a disband and detect the internal heating by an infrared camera to identify the disband (see for example Shepard et al – US 2002/0172410 A1 – Fig. 19 and [0061], [0119]-[0127]), upon reconsideration it is agreed that the prior art does not suggest inducing acoustic chaos by applying sound signal to the sample to significantly increase the vibration of the edges of cracks against each other so that imperfections are more visible in the thermal images.

Regarding independent claim 13, the prior art does not disclose or fairly suggest a system for creating acoustic chaos in a structure, the system comprising a sound source coupled to the structure under a predetermined force, the sound source applying a pulsed sound signal to the structure wherein the amount of force, the duration of the pulsed sound signal and the frequency of the sound signal act to induce acoustic chaos in the structure to cause the structure to vibrate in a chaotic manner so that imperfections are more visible in thermal images.

The examiner notes that while it is known in the art of a vibrothermography system to generate acoustic energy sound source in the frequency range of 10 kHz to 30 kHz that is either continuously or in a time varying mode and applying that energy to a sample where the energy is absorbed by the sample which causes internal frictional heating between the faces of the crack or disbond (see for example Shepard et al – US 2002/0172410 A1 – Fig. 19 and [0119]), upon reconsideration it is agreed that the prior art does not suggest the amount of force, the duration of the pulsed sound signal and the frequency of the sound signal act to induce acoustic chaos in the structure

Regarding independent claim 14, the prior art does not disclose or fairly suggest a defect detection system for detecting a defect in a structure, comprising an electronic chaos signal generator that generates a chaos signal, a broadband transducer receiving the chaos signal, and a coupler coupling the transducer of the structure to convert the chaos signal to a sound signal that induces acoustic chaos of the structure.

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The examiner notes that while it is known in the art of a thermal imaging system wherein the ultrasonic energy from the transducer is coupled to the specimen through a coupler and the coupler allows the sound signal to enter the component with less attenuation (see for example Thomas et al – US 6,399,948 B1 – col. 4, lines 51-67 and col. 5, lines 1-5), upon reconsideration it is agreed that the prior art does not suggest the amount of force, the duration of the pulsed sound signal and the frequency of the sound signal act to induce acoustic chaos in the structure.

Regarding independent claim 43, the prior art does not disclose or fairly suggest a defect detection system for detecting a defect in a structure, comprising an ultrasonic pulse sound signal coupled to the structure where the pulse signal has a pulse width and frequency, and wherein the predetermined force, frequency of the ultrasonic signal and the pulse width of the ultrasonic signal are selected so that the ultrasonic signal induces acoustic chaos in the structure.

The examiner notes that while it is known in the art for infrared or thermal imaging of ultrasonically or sonically excited subsurface defects in a material where a sound source couples sound waves into the material with minimum attenuation, where the sound waves are generated by pulses of energy having a constant frequency amplitude for a predetermined period of time and in one embodiment, the sound source is an electromagnetic acoustic transducer (EMAT) that provides broadband, pulsed ultrasonic energy. The EMAT is capable of changing the frequency of the signal during a pulse to increase the

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probability that the signal reaches all areas of the material (see for example Thomas et al – US 6,399,948 B1 – col. 3, lines 18-30), upon reconsideration it is agreed that the prior art does not suggest the amount of force, the duration of the pulsed sound signal and the frequency of the sound signal act to induce acoustic chaos in the structure.

Regarding independent claim 50, the prior art does not disclose or fairly suggest a method for detecting defects in a structure comprising the step of coupling a sound source to the structure in a manner that the sound signal induces acoustic chaos in the structure.

The examiner notes that while it is known in the art of a thermal imaging system to comprise an electromagnetic acoustic transducer (EMAT) wherein the (EMAT) is coupled to the component and introduces pulsed sound signals to heat up the imperfections of the component (see for example Thomas et al – US 6,399,948 B1 – Abstract), upon reconsideration it is agreed that the prior art does not suggest the sound source coupled to the structure in a manner so that the sound signal induces acoustic chaos in the structure that cause the structure to vibrate in a chaotic manner and heat defects so that imperfections are more visible in thermal images.

The remaining claims 2-12, 35-42, 44-49 and 51-54 are allowable based on their dependency.

### ***Conclusion***

4. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Faye Polyzos whose telephone number is


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571-272-2447. The examiner can normally be reached on Monday thru Friday from 7:30 AM to 4:00 PM.

5. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dave Porta can be reached on 571-272-2444. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

6. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

FP



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